Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Petition for Waiver to Allow Deployment of	)	GN Docket No. 18-357
Cellular Vehicle-to-Everything (C-V2X)	)	
Technology in the 5.9 GHz Band	)	

COMMENTS OF BROADCOM INC.

Broadcom Inc. ("Broadcom") submits these comments in response to the petition for waiver filed by the 5G Automotive Association ("5GAA") to allow the deployment of Cellular Vehicle-to-Everything ("C-V2X") technology in the upper 20 megahertz of the 5850-5925 MHz band (the "5.9 GHz band").[1/] While Broadcom appreciates 5GAA's efforts to develop advanced connected vehicle technology, it urges the Commission to deny the Petition. Grant of the waiver would create further uncertainty regarding future use of this band and would stall investment in technologies proposed for this band. Significant effort has already been made by industry, the Commission, and the Department of Transportation ("DoT") to evaluate the 5.9 GHz band for shared use between Dedicated Short Range Communications ("DSRC") and unlicensed devices. Before evaluating other uses of the band, including C-V2X, the Commission should complete its assessment of the alternatives for the band already under consideration in that proceeding. If,

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1/ *See* 5GAA Petition for Waiver, GN Docket No. 18-357 (filed Nov. 21, 2018) ("Petition"). The FCC's Office of Engineering and Technology ("OET") and the Wireless Telecommunications Bureau ("WTB") issued a Public Notice seeking comment on the Petition. *See Office of Engineering and Technology and Wireless Telecommunications Bureau Seek Comment on 5GAA Petition for Waiver to Allow Deployment of Cellular Vehicle-to-Everything (C-V2X) Technology in the 5.9 GHz Band*, GN Docket No. 18-357, Public Notice, DA 18-1231 (rel. Dec. 6, 2018) ("*Public Notice*"); *see also Office of Engineering and Technology and Wireless Telecommunications Bureau Extend Comment Cycle Deadlines on 5GAA Petition for Waiver to Allow Deployment of Cellular Vehicle-to-Everything (C-V2X) Technology in the 5.9 GHz Band*, GN Docket No. 18-357, Public Notice, DA 18-1310 (rel. Dec. 31, 2018) (extending the comment and reply comment deadlines to January 18, 2019, and February 5, 2019, respectively); *Revisions to Filing and Other Deadlines Following Resumption of Normal Commission Operations*, Public Notice, DA 19-26 (rel. Jan. 29, 2019) (stating that filings that would otherwise be due between January 8 and February 7, 2019, will be due on February 8, 2019).

during that evaluation, 5GAA wishes to further explore the potential deployment of C-V2X in the 5.9 GHz or other bands, it has other means for doing so. For instance, 5GAA could seek an experimental authorization under Part 5 of the FCC's rules to test the deployment of C-V2X.

I. BACKGROUND AND SUMMARY

The Petition must be considered in the context of the past and ongoing efforts to evaluate potential uses of the 5.9 GHz band. In 1999, the FCC adopted rules permitting DSRC-based Intelligent Transportation System ("ITS") communications in the band.[2/] Recognizing the need for additional spectrum for unlicensed devices, the Commission sought comment in 2013 on also making the 5.9 GHz band available for Unlicensed National Information Infrastructure ("U-NII") use.[3/] In 2016, the Commission invited interested parties to update and refresh the record on the status of potential sharing solutions between proposed U-NII devices and DSRC operations in the band, solicited the submission of prototype devices for testing, and requested comment on a three-phase test plan to evaluate the compatibility of unlicensed devices and DSRC.[4/] OET recently announced that it completed the first phase of that testing and requested comment on a report containing its results.[5/]

The ongoing 5.9 GHz band proceeding has involved extensive efforts by both the automotive and communications industries, and grant of the Petition would undermine that work

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[2/] *See Amendment of Parts 2 and 90 of the Commission's Rules to Allocate the 5.850-5.925 GHz Band to the Mobile Service for Dedicated Short Range Communications of Intelligent Transportation Services*, Report and Order, 14 FCC Rcd 18221 (1999).

[3/] *See Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band*, Notice of Proposed Rulemaking, 28 FCC Rcd 1769 (2013).

[4/] *See The Commission Seeks to Update and Refresh the Record in the "Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band" Proceeding*, Public Notice, 31 FCC Rcd 6130 (2016).

[5/] *See Office of Engineering and Technology Requests Comment on Phase I Testing of Prototype U-NII-4 Devices*, ET Docket No. 13-49, Public Notice, DA 18-1111 (rel. Oct. 29, 2018) ("*2018 Phase I Testing Public Notice*").

by injecting uncertainty that may deter further participation and investment. The Commission should therefore defer any action on potential use of the 5.9 GHz band by C-V2X until it completes the current process of evaluating the potential shared use of the band for unlicensed operations. If 5GAA seeks more immediate access to the spectrum to evaluate its potential use for C-V2X, it can take advantage of the FCC's experimental licensing rules under Part 5.

II. THE COMMISSION SHOULD MAKE NO DECISIONS ON THE USE OF THE 5.9 GHz BAND FOR C-V2X OR OTHER TECHNOLOGIES UNTIL IT COMPLETES THE CURRENT EVALUATION PROCESS

As detailed above, the Commission has been evaluating the potential shared use of the 5.9 GHz band by U-NII devices for nearly six years. Broadcom and others have actively participated in the Commission's 5.9 GHz band proceeding and invested substantial resources toward its successful conclusion.[6/] As the Commission is aware, Broadcom has proposed a re-channelization plan under which 30 megahertz of spectrum in the 5.9 GHz band would be dedicated exclusively for more delay sensitive, safety-of-life ITS applications, such as for Basic Safety Messaging, while the remaining 45 megahertz would be available for all other ITS applications and unlicensed use on a shared basis.[7/] Broadcom and others have explained throughout the Commission's 5.9 GHz band proceeding, and more recently to the National Highway Traffic Safety Administration, that re-channelization is the best approach to advance

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6/ *See, e.g.*, Comments of Broadcom Ltd., ET Docket No. 13-49 (filed July 7, 2016) ("Broadcom Refresh Comments"); Comments of Wi-Fi Alliance, ET Docket No. 13-49 (filed July 7, 2016).

7/ *See* Broadcom Refresh Comments at 2-3; *see also* Letter from Christopher Szymanski, Director, Product Marketing and Government Affairs, Broadcom Ltd., to Marlene H. Dortch, Secretary, FCC, ET Docket No. 13-49, Attachment at 4 (filed May 5, 2016) ("Broadcom Sharing Proposal").

the Commission's twin goals of increasing the spectrum available for unlicensed devices while also protecting incumbent DSRC safety-of-life communications.[8/]

Moreover, Broadcom and others have heavily invested in the Commission's three-phase testing process by, among other things, providing OET with Wi-Fi prototype equipment and DSRC prototype equipment configured to operate in 20-megahertz channels for testing.[9/] It also provided a software update to its Wi-Fi prototypes to allow the FCC to test the effectiveness of assigning priority to co-channel DSRC traffic.[10/] Other parties, including Cisco, Qualcomm, KEA Tech, CAV technologies, and DoT, similarly submitted devices to OET for testing.[11/] Using these devices, OET has performed approximately 1,450 individual tests, collecting more than one million data points.[12/]

These efforts have been substantial, and the Commission should neither diminish them nor create uncertainty about the remainder of the process it has already initiated. It is particularly important that the Commission not disrupt the ongoing proceeding, in which it has been asked to take a fresh look at the 5.9 GHz band for unlicensed operations.[13/] But that is exactly what grant of the Petition would do. Granting the Petition would not only undermine past efforts, but would also create uncertainty for key stakeholders in the automotive and communications industries, potentially stalling the development of both unlicensed and DSRC

8/ *See* Broadcom Refresh Comments at 1 (internal citations omitted); *see also* Comments of Broadcom Corporation, Docket No. NHTSA-2016-0126, RIN 2127-AL55, at 5 (filed Apr. 12, 2017) ("Broadcom NHTSA Comments").

9/ *See* Laboratory Division, OET, FCC, Phase I Testing of Prototype U-NII-4 Devices at 13-14 (2018), https://docs.fcc.gov/public/attachments/DA-18-1111A2.pdf.

10/ *See id.* at 13.

11/ *See 2018 Phase I Testing Public Notice* at 1-2.

12/ *See id.* at 2.

13/ *See* Letter from Rick Chessen, Chief Legal Officer, NCTA, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 13-49 (filed Oct. 16, 2018) (urging the FCC to take a fresh look at the 5.9 GHz band).

technologies in the 5.9 GHz band. Like any technology company, Broadcom cannot invest in, or plan for use of, spectrum unless it is reasonably certain that regulatory action will permit its deployment. Grant of the Petition will add further uncertainty as to whether Broadcom and others should invest further resources in the band. To continue to encourage that investment, the Commission should adhere to its current plan of evaluating the band for potential shared use by unlicensed devices. Only then should the Commission consider alternative uses of the spectrum, including for C-V2X technologies.

III. 5GAA HAS OTHER MEANS FOR ACHIEVING ITS GOALS

There is no need for the Commission to waive its rules, or initiate a rulemaking proceeding,[14/] for 5GAA to achieve its goals; 5GAA has other, more suitable options available that would not undermine the past and potential future investment in the potential use of the 5.9 GHz band. In particular, the Commission's Experimental Radio Service ("ERS") rules, which allow entities to secure experimental authorization for a broad range of activities and services, provide 5GAA with the exact means for fulfilling its desired outcome. The Commission specifically modernized its rules and ERS framework in order to reduce regulatory barriers and promote the development and introduction of new technologies into the marketplace. For instance, in 2013, among other things, the Commission clarified and broadened the market trial rules.[15/] The Commission has continued to modify its Part 5 rules, as necessary, to keep pace

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14/ *See* Petition at 2 (adding that 5GAA plans to file a complementary petition for rulemaking in the near future requesting that the FCC initiate a proceeding to modify its rules for the 5.9 GHz band).

15/ *See Promoting Expanded Opportunities for Radio Experimentation and Market Trials under Part 5 of the Commission's Rules and Streamlining Other Related Rules et al.*, Report and Order, 28 FCC Rcd 758 (2013).

with the speed of modern technological change and provide additional flexibility to facilitate emerging technologies.[16/]

And, as with all issues generally related to the use of the 5.9 GHz band, evaluation of 5GAA's proposal can and should occur as a part of the 5.9 GHz proceeding. Indeed, the Commission acknowledged in the *2018 Phase I Testing Public Notice* that a number of developments have occurred since the three-phase test plan was announced and therefore invited comment specifically on the development of C-V2X technology.[17/] A full evaluation of C-V2X capabilities, including its purported benefits and potential harms, such as adjacent-band interference, would be more appropriately conducted in that proceeding.

Only in the context of the existing proceeding can the Commission appropriately consider all potential alternative uses of the 5.9 GHz band. The potential benefits and deployment of C-V2X technologies are uncertain. In fact, the European Commission is currently developing legislation that would likely rule out the use of C-V2X in Europe.[18/] At the same time, Phase I testing has demonstrated that Wi-Fi and DSRC devices are able to coexist, and this band could be used to satisfy the skyrocketing need for unlicensed spectrum.[19/] Consideration of the use of

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16/ *See Promoting Expanded Opportunities for Radio Experimentation and Market Trials under Part 5 of the Commission's Rules and Streamlining Other Related Rules et al.*, Second Report and Order, 31 FCC Rcd 7529 (2016); *Promoting Expanded Opportunities for Radio Experimentation and Market Trials under Part 5 of the Commission's Rules and Streamlining Other Related Rules et al.*, Memorandum Opinion and Order and Further Notice of Proposed Rulemaking, 30 FCC Rcd 7446 (2015).

17/ *See 2018 Phase I Testing Public Notice* at 2.

18/ *See, e.g.*, Diana Yordanova, *Industry Split on European Connected-Car Rules*, WARDSAUTO, Nov. 16, 2018, https://www.wardsauto.com/technology/industry-split-european-connected-car-rules.

19/ As Broadcom and others have documented, there has been an explosive growth in Wi-Fi since spectrum for DSRC was allocated. *See* Letter from Chris Szymanski, Director Product Marketing & Government Affairs, Broadcom Inc., to Marlene H. Dortch, Secretary, FCC at 1 (filed Oct. 17, 2018); Broadcom NHTSA Comments at 7; *see also* CISCO, VNI Complete Forecast Highlights Tool, North America, United States, Wired Wi-Fi and Mobile Growth (2018), http://www.cisco.com/c/m/en_us/solutions/service-provider/vni-forecast-highlights.html (select "United States" from the "North America" drop-down menu, select "2022 Forecast Highlights" and expand "Wired Wi-Fi and Mobile Growth")

the 5.9 GHz band for C-V2X can only occur alongside the evaluation of how the band can help meet the skyrocketing need for unlicensed spectrum and Wi-Fi devices.

IV. CONCLUSION

Broadcom appreciates that 5GAA wishes to commercialize technology that it believes has the potential to enhance transportation safety. However, the automotive and communications industries, as well as the FCC and the DoT, have already invested substantial resources in evaluating the potential use of the 5.9 GHz band for unlicensed operations. The Commission should not reduce the value of those investments and dissuade future efforts by granting 5GAA's request, particularly when 5GAA has other more appropriate means by which it can achieve its goals, such as by obtaining an experimental authorization. The Commission should finalize its evaluation of the potential use of the 5.9 GHz band for unlicensed technologies before it considers any other use of the band.

Respectfully submitted,

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(finding that "fixed/Wi-Fi was 50.4% of total Internet traffic in 2017, and will be 56.6% by 2022"). Studies have shown that unlicensed technologies led by Wi-Fi will contribute a total of $547 billion to the U.S. economy in 2017 alone and add approximately $50 billion to the U.S. GDP. *See* Corrected Comments of Broadcom Corporation, IB Docket No. 16-185, at 3 (filed Nov. 9, 2017) ("Broadcom WAC Comments"); Broadcom NHTSA Comments at 7-8. In addition, it is widely recognized that 5G will depend on a mixture of licensed and unlicensed technologies, and 5 GHz unlicensed spectrum will be at the core of the 5G ecosystem. *See* Broadcom WAC Comments at 4 (explaining that Wi-Fi and other unlicensed technologies will play a key role in the network densification needed to achieve 5G speeds).